

## C l a i m s

1. A method for hyperpolarizing atomic nuclei through optical pumping in a test cell, whereby polarization of an electron spin of an optically pumpable species in a mixture created by means of a laser light is transferred to the nuclear spin of an atom to be hyperpolarized, characterized in that components of the mixture and/or for the hyperpolarization of inert compounds are guided into the test cell such that the mixture does not or only to a slight degree touch the inner walls of the test cell.
2. A method according to Claim 1 characterized in that the mixture is inclined in the direction of flow, especially at a 45° angle to the side wall, when guided into the test cell.
3. A method according to Claim 1 or 2, characterized in that the mixture with optically pumpable species and nuclei to be hyperpolarized is guided as a free beam into the test cell.
4. A method according to any of the previous claims, whereby a bypass flow consisting of a compound for the separation of the mixture from the inner walls is guided into the test cell.

5. A method according to any of the previous claims, characterized in that the laser light is radiated into the test cell perpendicularly to the direction of flow of the mixture flowing in the test cell.
6. A method according to any of the previous claims, characterized in that the laser light is radiated into the test cell in a counter current to the direction of flow of the mixture flowing in the test cell.
7. A method acc to any of the previous claims, characterized in that the mixture is disengaged at the point where the intensity of the laser is largest.
8. A method according to any of the previous claims, characterized in that the walls of the test cell are cooled.
9. A method according to any of the previous claims, characterized in that the spin exchange is transferred indirectly via a non-optically pumpable species to the nuclear spin of a nucleus to be hyperpolarized.
10. A method according to any of the previous claims, whereby  $^{129}\text{Xe}$ ,  $^3\text{He}$  or  $^{13}\text{CO}_2$  are hyperpolarized.
11. A device for implementing a method according to any of the previous claims 1 to 10, characterized by at least one means feeds into the test cell the components of the mixture out of optically pumpable species and hyperpolarizable nuclei and/or other compounds inert to hyperpolarization such that the mixture does not touch or only slightly touches the inner walls of the test cell.
12. The device according to claim 11, characterized in that

- the inlet and/or outlet forms a predetermined angle to the longitudinal axis of the test cell, in particular 45°.
13. The apparatus according to one of claims 11 or 12, cit at least one nozzle is the means.
  14. The apparatus according to one of preceding claims 11 to 13, characterized in that the means forms a free column for injecting the mixture into the test cell.
  15. The apparatus according to one of preceding claims 11 to 14, characterized in that the mes means is a surrounding stream for the mixture.
  16. The apparatus according to one of preceding claims 11 to 15, characterized in that at leas tone laser is set such that the laser beam is oriented perpendicular and/or countercurrent to the flow of the mixture in the test cell.
  17. The apparatus according to one of preceding claims 11 to 16, characterized in that the input window or windows of the test cell have for the laser beam the greatest possible spacing from the input of the test cell for the optically pumpable species.
  18. The apparatus acc one of claims 11 to 17, characterized by the provision of at least one supply container for a chemical species.
  19. The apparatus according one of preceding claims 11 to 18, characterized in that the supply container is mounted in the supply line(s) of the apparatus.
  20. The apparatus according to one of preceding claims 11 to 19, characterized by means for cooling walls of the test cell.

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## New claims

1. A method for hyperpolarizing atomic nuclei through optical pumping in a test cell, whereby polarization of an electron spin of an optically pumpable species in a mixture created by means of a laser light is transferred to the nuclear spin of an atom to be hyperpolarized, characterized in that components of the mixture and/or for the hyperpolarization of inert compounds are guided into the test cell such that the mixture does not touch the inner walls of the test cell.

11. An apparatus for implementing the method according to any of the previous claims 1 to 10, characterized by at least one means for feeding into the test cell the components of the mixture out of optically pumpable species and hyperpolarizable nuclei and/or other compounds inert to hyperpolarization such that the mixture does not touch the inner walls of the test cell.